Letters to the Editor

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Distinguishing solid from gaseous emboli during cardiac surgery

To the Editor:

We read with interest the article by Abu-Omar and colleagues[1] regarding the use of a multifrequency Doppler system to identify solid and gaseous cerebral emboli during cardiac surgery. Although this system has been validated in two clinical situations, patients with carotid artery stenosis and those with mechanical heart valves, it has not however, been tested in large studies of patients undergoing cardiopulmonary bypass. As the authors of the original validation study point out, there are limitations of automatic cerebral emboli detection with the multifrequency Doppler system.[2] First, automatic detection and counting are unreliable in situations with a high frequency of emboli. This might not be a significant problem in the case of patients with mechanical valves or carotid artery stenosis, where the frequency of emboli generation is low, but certainly will be during cardiac surgery, where showers of emboli are frequently associated with clamp removal and rewarming. Second, highly echogenic particles—solid or gaseous—can generate high-intensity embolic signals, leading to receiver overload and aliasing. These particles would cause a bidirectional intensity increase and thus lead to mistaken identification of such embolic signals as artifact. Thus the number of embolic signals detected by Abu-Omar and colleagues[1] probably underestimates the true embolic burden, especially during the on-pump and open procedures. As a result there is a large difference between the emboli count detected during on-pump coronary artery bypass grafting with this study and that seen in other investigations that have used a Doppler machine that insonates a vessel with only one frequency.[3]

We also note that the cardiopulmonary bypass technique did not involve use of an arterial filter and that cardiotomy suction was used without a cell saver. Arterial filters have been shown to significantly reduce the amount of cerebral embolization and neurocognitive impairment, and if a cell saver is used to retrieve and process shed mediastinal blood, the microembolic burden is reduced relative to direct autotransfusion from cardiotomy suction.[4,5] It is important that these methodologic deficiencies be taken into account if this cohort of patients is to undergo neurocognitive assessment.

Reza Motallebzadeh, MRCS
Marjan Jahangiri, FRCS
Department of Cardiac Surgery
St George's Hospital & Medical School
London, United Kingdom

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Reply to the Editor:

We thank Motallebzadeh and Jahangiri for their interest in our article.

The advantages of multirange, multifrequency transcranial Doppler technique are, respectively, rejection of artifacts and differentiation between gaseous and solid microemboli. This is of particular relevance because automatic rejection of artifacts significantly reduces bias in the interpretation